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Design and Construction Requirements for Establishing Herbaceous Wetland Vegetation

PURPOSE: This technical note addresses some considerations and techniques for restoring or establishing herbaceous wetland vegetation. It also provides references for a more in-depth discussion of these considerations and techniques.

BACKGROUND: According to various investigators, scientists are only beginning to understand the process of wetland plant adaptation to the environment. In addition, and more importantly, scientists are investigating the effects of wetland plants on the environment.

FACTORS AFFECTING HERBACEOUS WETLAND ESTABLISHMENT: It is difficult to summarize wetland establishment and restoration in general terms and within a short technical note because so much is dependent upon the life requisites of individual plants, groups of plants, and the organisms that live in wetland communities. Three important factors, however, contribute to the diversity of natural wetlands and form the basis for any wetland development protocol. These are hydrologic considerations, substrate, and vegetation. Assuming the above ingredients are correctly applied, scientists may either rely on natural colonization of the area with wetland plants or on artificial propagation techniques, such as seeding or transplanting. Through an understanding of the relationship between these factors, it is possible to determine which species should be planted, and by what means, under given environmental conditions. A more thorough discussion of these factors can be found in Department of the Army (1987), Lewis (1982), Allen and Klimas (1986), Allen, Pierce, and Van Wormer (1989), and Kusler and Kentula (1990).

When artificial propagation techniques are applied, seven forms of propagules are available for wetland vegetation establishment: seeds, rootstocks, rhizomes, tubers, cuttings, seedlings, and transplants. The most commonly used propagules for wetland establishment include all but seeds. Seed stands are typically difficult to establish because of unknown scarification and stratification requirements and loss of seeds via water action. Some successes have occurred with seeds of bottomland oaks and when wetland turf or agricultural grasses are used (1) on upper portions of basins that are never flooded or are not flooded until after seeds are established or (2) on saturated drawdown zones of reservoirs shortly after the water has been withdrawn. Wet prairie species also have been established in the tall grass prairie province by planting wild collected seeds with a seed drill.

SPRIGS AS A HERBACEOUS WETLAND ESTABLISHMENT TECHNIQUE: The most frequently used propagule for establishing marsh grasses and other herbs is sprigs. Often, sprigs are harvested from existing marsh stands and transferred to the target site. In other cases, seeds are germinated in the greenhouse to produce sprigs. An early study found that 44 *Spartina* seedlings germinated and tilled in the greenhouse generated 30,601 sprigs in about 10 months. The multiplication rate was 695 times. Tillering occurs when the seedling is placed in a soft growing medium, such as a mixture of vermiculite and sand, to allow the plant to produce shoots from the root or base of the stem. These shoots are continually dividing into more stems with roots. When these stems with roots are divided, they are called sprigs and can be transferred to the target site for planting or to transplanting beds or pots for later use.

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SOILESS PROPAGATION TECHNIQUE: In Germany, Bestmann Ingenieurbiologie (bioengineering) has developed a system of propagating plants grown in a coconut fiber substrate without soil. Seedlings are produced in the greenhouse either from seed or vegetatively from tillering as described above. Plants are transferred as young seedlings to shallow-water flats outside the greenhouse containing the substrate and allowed to grow and spread (Figure 1). The substrate is treated with a fertilizer mixture to provide nutrients. After the substrate is filled with plants, the substrate and the pregrown plants are transferred to the target site and installed. This system offers several advantages:

- the substrate with pregrown plants and without soil is light and easily transportable;
- the substrate can be laid down as carpet (Figure 2), pallets (Figure 3), or individual bulblike containers (Figure 4), and is ready to grow with roots already established; and
- the pregrown plants in combination with the substrate produce a wetland system with high tensile strengths.

Figure 1. Plants transferred to shallow-water flats

Because of these advantages, such propagation methods lend themselves to areas where rapid and almost immediate wetland development is desired, such as in erosive environments along streambanks and lake shorelines.

This wetland system is good to use with low-cost building materials and structures for erosion control, such as stakes, posts, wire, and breakwaters. Such a combination of plants and building materials or structures is referred to as "bioengineering." Bestmann has used the above propagation approach using mostly freshwater herbaceous plants, such as various sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and other forbs and grasses. Further information regarding this system can be obtained from the following source: Bestmann Green Systems, Attn: Ms. Wendi Goldsmith, P.O. Box 88, Boston, MA 02133, Phone 617-723-9404, Fax: 617-723-9430.

REFERENCES:

Allen, H. H., Klimas, C. V. 1986. Reservoir shoreline revegetation guidelines. Technical Report E-86-13. Vicksburg, MS: US Army Engineer Waterways Experiment Station.

Figure 2. The substrate laid as carpet

Figure 3. The substrate laid as pallets

Figure 4. The substrate laid as individual bulblike containers

Allen, H. H., Pierce, G. J., and Van Wormer, R. 1989. *Constructed wetlands for wastewater treatment: Municipal, industrial, and agricultural.* Donald A. Hammer, ed., 405-415, Chapter 33. Chelsea, MI: Lewis Publishers, Inc.

Department of the Army. 1987. Beneficial uses of dredged material. Engineer Manual 1110-2-5026. US Army Corps of Engineers, Washington, DC.

Kusler, J. A., and Kentula, M. E. eds. 1990. *Wetland Creation and Restoration*, Island Press, Washington, DC.

Lewis, R. R., III, ed. 1982. *Creation and Restoration of Coastal Plant Communities*, Boca Raton, FL: CRC Press, Inc.

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